

REMARKS

Reconsideration of the above-referenced application is respectfully requested.

Claims 1-29 and 31-37 are pending. Claim 30 has been cancelled. Claims 1-14 and 27 have been withdrawn from consideration. Attached is a marked-up version of the changes being made to claims 15, 17, 26, 28, 29, and 31-36 by the current amendment.

CLAIMS 32-35

Claims 32-35 stand rejected under 35 U.S.C. §112, 2nd paragraph as being indefinite. Applicants have amended claims 31-35 to address the Examiner's concerns.

CLAIM 28

Independent claim 28 stands rejected under 35 U.S.C. §102(b) as anticipated by Pope '513 (US 5,693,513), Pope '020 (US 5,739,020), Hino et al. (US 4,148,689), or Uo et al. (J. Ceram. Soc. Jpn. 100, p. 426-429).

Claim 28, as amended, relates to a gel that includes a macroporous solid network and a bacterial cell. Gels that include a bacterial cell (i.e., *E. coli*) are described, e.g., at page 19, lines 16-21 of the specification.

None of the cited references describe or suggest gels as described in claim 28. Pope '513, Pope '020, and Hino et al. fail to describe or suggest a gel that includes macroporous solid network. Uo et al. describes gels that include a yeast cell rather than a bacterial cell. See, e.g., Uo et al., Section 2.2, page 427. Applicant therefore respectfully submits that amended claim 28 is not anticipated by the cited art.

Claim 28 also stands rejected under 35 U.S.C. §103(a) as being obvious over Pope '513 or Pope '020, Uo et al., and Nakanishi et al. (US 4,148,689) or Kajihara et al. (J. Am. Ceram. Soc. 81, p. 2670-2676) and, if necessary, in further view of Hino et al.

As discussed above, Pope '513, Pope '020, and Hino et al. all fail to describe or suggest a gel that includes macroporous solid. Indeed, Pope '020 and Hino et al. suggest that macroporous gels are undesirable. See, e.g., Pope '020, col. 4, line 30-36 where the large difference between pore size and cell size is seen as illustrative of the gentleness of the sol-gel process, and Hino et al., col. 3, line 35-40 where the desirability of transparent gels is discussed.

Moreover, each of Pope '513, Pope '020, Uo et al., and Hino et al. describe the need for mild reaction conditions when incorporating delicate materials such as cells into gels. See, e.g., Pope '513, col. 2, line 15-17, Pope '020, col. 4, line 35-39, Uo et al., Section 2.2, page 427, and Hino et al., col. 4, line 30-41.

On the other hand, Nakanishi et al. describes the introduction of mesopores into the walls of porous inorganic gels formed by gelation in a sol solution that includes a precursor of a "matrix dissolving agent." See, e.g., col. 5, line 6-34. In order to release the matrix dissolving agent, Nakanishi et al. thermolyzes the precursor. For example, urea is thermolyzed by heating to temperatures between 60°C and 200°C. After thermolysis with urea, the pH of the solution is between 9.0 and 11.0 and dissolution of the walls of porous inorganic gels proceeds. Other precursors of matrix dissolving agents described by Nakanishi et al. include formamides and acetamides.

Kajihara et al. describes the macroporous titania gels formed by gelation in a sol solution that contains between five and ten moles of ethanol for every mole water. See, e.g., Table I of Kajihara et al. It is well known that ethanol can act as an antimicrobial agent.

Applicant respectfully submits that there is no suggestion to combine any of Pope '513, Pope '020, Uo et al., and Hino et al. with Nakanishi et al. or Kajihara et al. to achieve a gel that includes a macroporous solid network and a bacterial cell, as described in amended claim 28. Pope '020 and Hino et al. both suggest that macroporous gels are undesirable. Moreover, the relatively harsh reaction conditions described by Uo et al., Nakanishi et al., and Kajihara et al. would not lead one of ordinary skill in the art to believe that a bacterial cell could be included in a gel having the macroporous solid network of any of Uo et al., Nakanishi et al., or Kajihara et al.

Since there is no suggestion to combine the references in the manner suggested, a *prima facie* case of obviousness has not been established. Applicant therefore respectfully submits that amended claim 28 is patentable over the cited art.

CLAIM 15

Independent claim 15 stands rejected under 35 U.S.C. §102(b) as anticipated by Uo et al. Claim 15 has been amended to relate to a sol that includes P moles of a hydroxy metallate, W moles of water, a sufficient amount of a dispersant to cause macropores in a gel formed by said

sol, and a biological material. The ratio of W moles of water to P moles of a hydroxy metallate is greater than 25:1. Once amended claim 17, which described the same ratio of W:P, was rejected under 35 U.S.C. §103(a) as obvious over the combination of Uo et al., Klein et al. (*Better Ceramics Through Chemistry: MRS Symp. Proc.* Vol. 32, p. 33-39), and Rao et al. (*J. Sol. Gel. Sci. Tech.* 3, p. 205-217).

Rao et al. describes a sol solution with a W:P ratio of 16:1 which is below the W:P ratio of 25:1 in amended claim 15. Moreover, Rao et al. neither describes nor suggests sol solutions that include a biological material.

Uo et al. describes a sol solution with a W:P ratio of 15:1 which is below the W:P ratio of 25:1 in amended claim 15. Uo et al. also describes sol solutions that include sporulated yeast cells that were selected based on their durability toward organic solvents. See, e.g., Uo et al., Section 2.2, page 427.

Klein et al. describes a sol solution with a W:P ratio of 32:1. In Klein et al., the sol solutions with elevated W:P ratios have additional ethanol to permit solubility of the increased water in the sol solution. See, e.g., Klein et al., page 34, last sentence of the second paragraph. In particular, the sol solution with a W:P ratio of 32:1 has four times as much ethanol as the sol solutions with W:P ratios of 4:1 discussed in Klein et al. Klein et al. also neither describes nor suggests sol solutions that include a biological material.

Applicant respectfully submits that there is no suggestion to combine Uo et al., Klein et al., and Rao et al. to achieve a sol solution with a high W:P ratio and a biological material, as described in claim 15. In fact, the references themselves teach away from their combination. Uo et al. explicitly identifies the incompatibility of some biological materials with organic solvents, while Klein et al. describes the need for excess organic solvent (i.e., ethanol) with sol solutions of high W:P ratios. Further, the incompatibility of ethanol with biological materials, e.g., as an antimicrobial agent or as a protein denaturant, is well known in the art and makes it unlikely that one of ordinary skill in the art would seek to combine Uo et al., Klein et al., and Rao et al. to achieve a sol solution as recited in amended claim 15.

Since there is no suggestion to combine the references in the manner suggested, and in fact the references teach away from their combination, a *prima facie* case of obviousness has not been established.

Once amended claim 17 was also rejected under 35 U.S.C. §103(a) as obvious over the combination of Pope '513 or Pope '020, Uo et al., Nakanishi et al. or Kajihara et al., Klein et al., Rao et al. and, if necessary, in further view of Hino et al. None of the newly cited references (i.e., Pope '513, Pope '020, Nakanishi et al., and Kajihara et al.) describe or suggest a W:P ratio greater than 25:1 and hence add nothing to the rejection discussed above.

Since there is no suggestion to combine the references in the manner suggested, and in fact the references teach away from their combination, a *prima facie* case of obviousness has not been established.

Applicant therefore respectfully submits that amended claim 15, and the claims dependent therefrom, are patentable over the cited art.

CLAIM 26

Independent claim 26 stands rejected under 35 U.S.C. §102(b) as anticipated by Uo et al. Claim 26, as amended, relates to a method that includes mixing a vegetative cell into a sol, mixing a sufficient amount of a dispersant into said sol to cause macropores in a gel formed by said sol; and gelling said sol to form said gel. Mixing a vegetative cell (i.e., *E. coli*) into a sol is described, e.g., at page 19, lines 16-21 of the specification.

The yeast cells immobilized by Uo et al. are not vegetative cells but rather spores. See, e.g., Uo et al., Section 2.2, page 427.

Applicant therefore respectfully submits that amended claim 26 is not anticipated by Uo et al.

Claim 26 also stands rejected under 35 U.S.C. §103(a) as being obvious over Pope '513 or Pope '020, Uo et al., and Nakanishi et al. or Kajihara et al. and, if necessary, in further view of Hino et al.

Applicant respectfully submits that there is no suggestion to combine any of Pope '513, Pope '020, Uo et al., and Hino et al. with Nakanishi et al. or Kajihara et al. to achieve the method as described in amended claim 26. As discussed above, Pope '020 and Hino et al. both suggest that macroporous gels are undesirable. Moreover, the relatively harsh reaction conditions described by Uo et al., Nakanishi et al., and Kajihara et al. would not lead one of ordinary skill in the art to mix a vegetative cell into any of the sols that form macroporous gels described Uo et al., Nakanishi et al., or Kajihara et al.

Since there is no suggestion to combine the references in the manner suggested, and in fact the references teach away from their combination, a *prima facie* case of obviousness has not been established. Applicant therefore respectfully submits that amended claim 26 is patentable over the cited art.

CLAIM 29

Independent claim 29 stands rejected under 35 U.S.C. §102(b) as anticipated by Uo et al. Claim 29, as amended, relates to a gel that includes a solid network and a vegetative cell. The solid network defines macropores and is formed by the condensation of hydroxy metallates from a sol solution. The vegetative cell added to the sol solution and thereby immobilized within said solid network.

The yeast cells immobilized by Uo et al. are not vegetative cells but rather spores. See, e.g., Uo et al., Section 2.2, page 427.

Applicant therefore respectfully submits that amended claim 29, and the claims dependent therefrom, are not anticipated by Uo et al.

Claim 29 also stands rejected under 35 U.S.C. §103(a) as being obvious over Pope '513 or Pope '020, Uo et al., and Nakanishi et al. or Kajihara et al. and, if necessary, in further view of Hino et al.

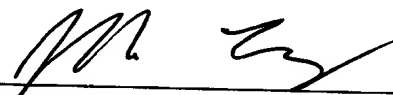
Applicant respectfully submits that there is no suggestion to combine any of Pope '513, Pope '020, Uo et al., and Hino et al. with Nakanishi et al. or Kajihara et al. to achieve a gel that includes a macroporous solid network and a vegetative cell, as described in amended claim 29. As discussed above, Pope '020 and Hino et al. both suggest that macroporous gels are undesirable. Moreover, the relatively harsh reaction conditions described by Uo et al., Nakanishi et al., and Kajihara et al. would not lead one of ordinary skill in the art to believe that a vegetative cell could be included in a gel having the macroporous solid network of any of Uo et al., Nakanishi et al., or Kajihara et al.

Since there is no suggestion to combine the references in the manner suggested, a *prima facie* case of obviousness has not been established. Applicant therefore respectfully submits that amended claim 29, and the claims dependent therefrom, are patentable over the cited art.

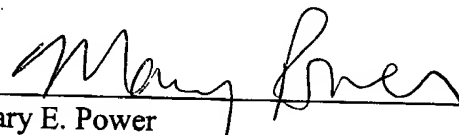
In view of the above remarks, therefore, all of the claims should be in condition for allowance. A formal notice to that effect is respectfully solicited.

Respectfully submitted,

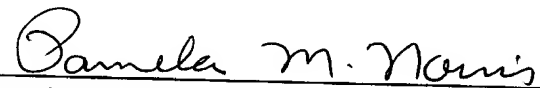
Date: 1/31/03


John F. Conroy

Date: Jan 23/03


Mary E. Power

Date: 1/23/03


Pamela M. Norris

1509 Still Meadow Cove
Charlottesville, VA 22901



VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 15, 17, 26, 28, 29, and 31-36 have been amended as follows:

15. (Twice Amended) A sol, comprising:

P moles of a hydroxy metallate;

W moles of water;

a sufficient amount of a dispersant to cause macropores in a gel formed by said sol; and
a biological material,

wherein a ratio of W:P is greater than 25:1.

17. (Twice Amended) The sol according to claim 15, wherein:

said hydroxy metallate is formed by hydrolysis of a sol-gel precursor[; and
a ratio of W:P is greater than 25:1].

26. (Amended) A method, comprising:

mixing a [biological material] vegetative cell into a sol;

mixing a sufficient amount of a dispersant into said sol to cause macropores in a gel
formed by said sol; and

gelling said sol to form said gel.

28. (Amended) A gel, comprising:

a macroporous solid network formed by the condensation of hydroxy metallates from a
sol solution; and

a bacterial cell added to the sol solution and thereby immobilized within said solid
network,

wherein said sol solution is compatible with said bacterial cell.

29. (Amended) A gel, comprising:
a solid network formed by the condensation of hydroxy metallates from a sol solution,
the solid network defining macropores; and
a [biological material] vegetative cell added to the sol solution and thereby immobilized
within said solid network.
31. (Amended) The gel of claim 30, wherein said solid network transmits [macropores
are abundant enough and dimensioned to transmit] less than about 35% of a 700 nm light beam
over a pathlength of about 0.9 cm when said macropores are filled with air.
32. (Amended) The gel of claim 31, wherein said solid network transmits [macropores
are abundant enough and dimensioned to transmit] less than about 30% of said light beam when
said macropores are filled with air.
33. (Amended) The gel of claim 32, wherein said solid network transmits [macropores
are abundant enough and dimensioned to transmit] less than about 18% of said light beam when
said macropores are filled with air.
34. (Amended) The gel of claim 33, wherein said solid network transmits [macropores
are abundant enough and dimensioned to transmit] less than about 9% of said light beam when
said macropores are filled with air.
35. (Amended) The gel of claim 33, wherein said solid network is [macropores are
abundant enough and dimensioned to be] opaque to said light beam when said macropores are
filled with air.
36. (Amended) The gel of claim [30] 29, wherein said vegetative cell is entrapped
within said solid network.